Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	**)**	
	)	
Amendment of the Commission's	**)**	**PR Docket No. 92-257**
Rules Concerning Maritime	**)**	
Communications	**)**	**EX PARTE SUBMISSION**

To: The Commission

SUPPLEMENTAL COMMENTS OF MARITEL, INC.

MariTEL, Inc. ("MariTEL") by its counsel and pursuant to the provisions of Section 1.415 of the rules and regulations of the Federal Communications Commission ("FCC" or "Commission") 47 C.F.R. § 1.415 (2003) hereby submits supplemental comments in the response to the Fourth Further Notice ("*Fourth Further Notice*") released by the FCC in the above referenced matter.[1/] In this proceeding, the Commission seeks comment on a variety of issues affecting the operation of public coast stations.

I. Background

The FCC released the *Fourth Further Notice* on December 28, 2001 and MariTEL submitted comments and reply comments in response to the *Fourth Further Notice* on April 5, 2002 and May 6, 2002, respectively. As described below, events have occurred since the release of the *Fourth Further Notice* and the submission of MariTEL's comments and reply comments that make the submission of these Supplemental Comments necessary. As noted above, MariTEL submits these Supplemental Comments pursuant to the provisions of Section 1.1206 of

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1/ *Amendment of the Commission's Rules Concerning Maritime Communications*, PR Docket No. 92-257, *Fourth Further Notice of Proposed Rulemaking*, 17 FCC Rcd 227 (2001) ("*Fourth Further Notice*"). MariTEL recognizes that the deadline for the submission of comments and reply comments in this proceeding has passed. MariTEL submits these Supplemental Comments pursuant to the provisions of Section 1.1206 of the FCC's rules. 47 C.F.R. § 1.1206 (2003).

the FCC's rules. Because of MariTEL's unique position as the sole licensee of geographic area maritime VHF Public Coast ("VPC") authorizations, and the impact that this proceeding will have on MariTEL, it is in the public interest for the FCC to include this *ex parte* submission in its consideration of this proceeding. MariTEL has submitted copies of these Supplemental Comments to all other entities that submitted either comments or reply comments in response to the *Fourth Further Notice*. It has also, pursuant to the provisions of Section 1.1206(b)(1) of the FCC's rules, submitted a copy of these Supplemental Comments electronically.

II. Discussion

MariTEL's principal purpose in submitting these Supplemental Comments is to address the FCC's potential implementation of regulations governing automatic identifications systems ("AIS").[2/] As noted below, circumstances that occurred after the release of the *Fourth Further Notice* and the submission of MariTEL's comments and reply comments require that the FCC revisit certain issues related to AIS implementation.

A. Specification of Channels for PAWSS

In the *Fourth Further Notice*, the FCC noted the provisions of Section 80.371 of its rules, which require that VPC licensees to enter into an agreement with the United States Coast Guard ("USCG") to specify up to two narrowband offset channel pairs to be used by the USCG's Ports

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2/ The FCC initially considered the issue of AIS in the context of the Docket No. 00-48 proceeding at the request of the National GMDSS Implementation Task Force. However, the Commission has made it clear that matters related to the licensing, equipment certification, and frequency coordination related to AIS will be addressed in this proceeding, and not the Docket No. 00-48 proceeding. *See Amendment of Parts 13 and 80 of the Commission's Rules Concerning Maritime Communications*, WT Docket No. 00-48, *Report and Order and Further Notice of Proposed Rule Making*, 17 FCC Rcd 6741 ¶ 57 n.145 (2002); *See also* "Wireless Telecommunications Bureau Announces Use of an Additional Frequency for the United States Coast Guard's Ports and Waterways Safety System," *Public Notice*, DA 02-1362; 17 FCC Rcd 10960 (2002).

and Waterways Safety System ("PAWSS").[3/] In its previous comments, MariTEL supported the modification to 80.371 to allow the flexibility for the parties to enter into an agreement regarding PAWSS channels that specifies "non-offset" rather than exclusively "off-set" channel pairs, if the parties so desire. At the time, MariTEL and the USCG had entered into a Memorandum of Agreement ("MOA") that contemplated the USCG's use of non-offset channels licensed to MariTEL.[4/] The *Fourth Further Notice* recognized the MOA, and agreed that parties should be permitted to specify non-offset channels if mutually agreeable in their attempt to comply with the provisions of Section 80.371 of the rules. However, the Commission asked whether its proposed amendment of the rules would be moot in light of the MOA.

Because of the termination of the MOA, this issue is no longer moot and MariTEL supports the Commission's desire to clarify the framework under which parties may reach an agreement for PAWSS channels. MariTEL encourages the Commission to ensure that the regulatory requirements – that the VPC licensee make available to the USCG "up to two narrowband offset channel pairs," is maintained, but recommends that the FCC allow other

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3/ As the FCC has noted, PAWSS is a Congressionally funded program to upgrade vessel traffic systems where traffic management is needed for congested or narrow navigable waterways. *See Amendment of the Commission's Rules Concerning Maritime Communications*, PR Docket 92-257, *Third Report and Order and Memorandum Opinion and Order*, 13 FCC Rcd 19853 ¶¶ 46, 47 (1998). *See also* S. Rep. No. 38, 107th Cong., at 30 (2001) (attributing appropriation for PAWSS "to implement and upgrade vessel traffic service systems in *select* ports.") (emphasis added); "Port and Tanker Safety Act of 1978," 86 Stat. 424; Oct. 17, 1978, P.L. 95-474, § 2, 92 Stat. 1471 (1978) (indicating that purpose of the Ports and Waterways Safety Program was to "establish, operate, and maintain vessel traffic services and systems for ports, harbors, and other waters subject to congested vessel traffic."); *Notice of Public Meeting*, "Office of Vessel Traffic Management," United States Coast Guard, 63 FR 24837 (1998) (explaining that the PAWSS program is designed to evaluate which ports require vessel traffic management, as determined by analysis of certain criteria including "traffic density [and] port geography.").

4/ Since that time, the MOA has been terminated.

channel assignments, if the parties desire. MariTEL, however, maintains that an agreement between the two parties specifying channels may vary from the regulatory requirements of 80.371 without the need to codify that agreement into regulations. The regulations, as MariTEL recommends, should provide the parities adequate flexibility to define and modify agreements based on the changing needs of the parties (i.e., the events of September 11, 2001).

B. Use of Shore Frequencies for Simplex Communications

The FCC has not contemplated the designation of particular channels for AIS shore operations; preferring instead to permit VPC licensees and the USCG to specify channels available for the PAWSS for each VPC. However, the FCC does contemplate the potential adoption of technical and equipment regulations regarding AIS operations.[5/] These technical and equipment regulations must conform to the FCC's rules and existing maritime spectrum conventions to ensure that AIS systems do not cause harmful interference to MariTEL other incumbent VPC licensees and potential maritime service subscribers. In that regard, MariTEL is particularly concerned about the USCG's assertion that:

> "Use of channel 87B by shipborne AIS in US navigable waterways is allowed under the MOA."

While the MOA is terminated, the USCG's statement highlights a fundamental issue involved in the USCG's desired simplex implementation of an AIS system. In particular, MariTEL believes that use of a "B" side (coast station) channel by ship stations in an AIS system will harmfully interfere with the use of MariTEL's licensed channels[6/] and MariTEL's use of its "B" side

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5/ *Fourth Further Notice* ¶ 17.

6/ *See* International Maritime Organization SN/Circ.227 at 3 (January 6, 2003), attached hereto as **Exhibit A.**

channels will harmfully interfere with the operation of an AIS system.[7/] The technical and equipment regulations governing AIS must address this issue.

MariTEL did not previously believe that the use of its channel 87B for AIS would cause harmful interference because it understood the MOA to contemplate the USCG's use of channel 87 A/B (along with additional channels) on a narrowband duplex basis for PAWSS. No explicit or implied justification can be found in the MOA for shipborne, simplex use of 87B. To the contrary, use of a "B" side channels for shipborne units are not supported under existing Commission rules and would require a waiver or rules change which, has not been proposed and is not otherwise in the public interest. Section 80.371 of the FCC's rules states that it "describes the radiotelephony working frequencies assigned to ship and public coast stations."[8/] Subsections of Section 80.371 describe channels assigned to ship stations and coast stations. Section 80.371(c) states that channels 87B and 88B, and all other "B" side frequencies are coast station channels. Ship stations are either authorized by rule[9/] or by separate FCC authorization if required by regulation, statute or otherwise. In either case, ship stations are not assigned particular channels on which to operate. Instead, they may operate on any channel permitted by the FCC's rules. As the FCC is aware, shipborne AIS equipment operates on VHF channels 87B and 88B[10/] in the high seas, but may also effectively be used on any channel in the marine band. Neither channels 87B and 88B or any other "B" side frequencies are among those channels;

7/ *See* "Automatic Identification System (AIS)/ Maritime Communication System (MSC) Interference Guidelines," presented by MariTEL to IALA Technical Working Group in Trondheim, Norway on August 28, 2003, attached as **Exhibit B**. The technical working group accepted the paper for presentation to the full IALA AIS Committee.

8/ 47 C.F. R. 80.371 (2003).

9/ *See* 47 C.F.R. 80.13 (2003).

10/ *See* Letter from Joseph Hersey, Jr., Chief, Spectrum Management Division, Office of Communications Systems, United States Coast Guard, to Thomas Sugrue, Chief Wireless Telecommunications Bureau, Federal Communications Commission (May 6, 2002).

channel 87B and 88B and all other B side frequencies are designated for coast station use. The FCC should not permit the use of these channels for AIS purposes in U.S. waters until the interference issues addressed above are successfully resolved.[11/]

Commission specification of the channels on which ships and coast stations operate is critical because use of coast station frequencies by ship stations would render the use of that channel and neighboring channels by the coast stations useless. Any FCC action to allow shipborne units to transmit on coast station channels would clearly have a deleterious effect on the viability of MariTEL's (and other incumbents') business opportunity as MariTEL will be unable to meet investment backed expectations by realizing value from the rights purchased through Auction 20. For these reasons, MariTEL requests that the Commission not allow shipborne users of AIS to operate on any "B" channel under existing ship station licenses until the Commission's rules have been changed to clarify and limit such use and to address the harmful interference that will be caused by ship station use of shore station channels.

11/ The FCC has permitted use of AIS transmitters on a temporary basis using channels 87B and 88B pending the outcome of this proceeding. *See* "Wireless Telecommunications Bureau Announces Use of an Additional Frequency for the United States Coast Guard's Ports and Waterways Safety System," *Public Notice*, DA 02-1362, 17 FCC Rcd 10960 (2002). MariTEL has asked the FCC to withdraw authorization of AIS shipborne transmitters for the reasons discussed herein. *See* Letters from Russell H. Fox, counsel to MariTEL, to D'Wana Terry, Chief, Public Safety and Private Wireless Division, Wireless Telecommunications Bureau (July 30, 2003 and August 11, 2003). These Supplemental Comments seek prohibition on a permanent basis (until all relevant interference issues have been addressed) of what MariTEL has sought on an interim basis already.

III. Conclusion

MariTEL urges the Commission to consider the foregoing Supplemental Comments and act in a manner consistent with the recommendations contained herein.

Respectfully submitted,

MARITEL, INC.

By: /s/ Russell H. Fox

Russell H. Fox
MINTZ, LEVIN, COHN, FERRIS,
GLOVSKY AND POPEO, P.C.
701 Pennsylvania Avenue, N.W.
Suite 900
Washington, D.C. 20004-2608
(202) 434-7300

Its Attorney

August 29, 2003

EXHIBIT A – INTERNATIONAL MARITIME ORGANIZATION GUIDELINES FOR THE INSTALLATION OF SHIPBORNE AIS

INTERNATIONAL MARITIME ORGANIZATION
4 ALBERT EMBANKMENT
LONDON SE1 7SR

Telephone: 020 7735 7611
Fax: 020 7587 3210
Telex: 23588 IMOLDN G

IMO

E

Ref. T2/8.02

SN/Circ.227
6 January 2003

GUIDELINES FOR THE INSTALLATION OF A SHIPBORNE AUTOMATIC IDENTIFICATION SYSTEM (AIS)

1 The Sub-Committee on Safety of Navigation (NAV), at its forty-eighth session (8 to 12 July 2002), agreed on guidelines for the installation of a Shipborne Automatic Identification System (AIS) and also agreed that they should be issued for use on a voluntary basis. The Guidelines describe the shipborne AIS installation matters and are meant to be used by manufacturers, installers and surveyors to ensure good installation practices.

2 The Maritime Safety Committee, at its seventy-sixth session (2 to 13 December 2002), concurred with the Sub-Committee's views, approved the Guidelines as set out at annex and encouraged their use for AIS installation purposes on a voluntary basis.

3 Member Governments are invited to bring the annexed guidelines to the attention of all concerned.

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ANNEX

GUIDELINES FOR THE INSTALLATION OF A SHIPBORNE AUTOMATIC IDENTIFICATION SYSTEM (AIS)

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1 General

The Automatic Identification System (AIS) Class A is defined by IMO and has been made a carriage requirement by the latest revision of SOLAS chapter V. AIS provides information that may be used for the navigation of the ship. It is therefore essential that the information provided by AIS be reliable.

The AIS itself has been standardised by the International Telecommunications Union (ITU) and the International Electrotechnical Commission (IEC) and is subject to type approval. In order to fulfil the reliability requirements of information exchange, care should be taken to ensure that the AIS is correctly installed.

This document contains guidelines for manufacturers, installers, yards, suppliers and ship surveyors. It does not replace documentation supplied by the manufacturer.

The guidelines take into account the following conventions, regulations, instructions and guidelines:

- IMO resolution MSC.90(73) Annex 7, Adoption of amendments to the International Convention for the Safety of Life at Sea, 1974, as amended.
- IMO resolution MSC.74(69) Annex 3, Recommendation on performance standards for AIS.
- ITU Radio Regulations (RR).
- IEC 60092 (series), Electrical Installations on Ships.
- IEC 60533 Electrical and Electronic Installations in Ships – Electromagnetic Compatibility.

1.1 Survey

Surveys on Convention ships should be carried out in accordance with the rules laid down in resolution A.746(18) "Survey Guidelines under the harmonised system of survey and certification", and "Protocol of 1988 relating to the International Convention for the Safety of Life at Sea, 1974, as amended."

1.2 Documentation

For the AIS installation the following drawings shall be submitted:

- Antenna layout
- AIS arrangement drawing
- Block diagram (interconnection diagram)

An initial installation configuration report should be produced during installation and kept on board.

2 AIS Installation

2.1 Interference to the Ship's VHF Radiotelephone

The AIS shipborne equipment, like any other shipborne transceiver operating in the VHF maritime band, may cause interference to a ship's VHF radiotelephone. Because AIS is a digital system, this interference may occur as a periodic (e.g. every 20 s) soft clicking sound on a ship's radiotelephone. This affect may become more noticeable when the VHF radiotelephone antenna is located near the AIS VHF antenna and when the radiotelephone is operating on channels near the AIS operating channels (e.g. channels 27, 28 and 86).

Attention should be paid to the location and installation of different antennas in order to obtain the best possible efficiency. Special attention should be paid to the installation of mandatory antennas like the AIS antennas.

2.2 VHF Antenna Installation

2.2.1 Location

Location of the mandatory AIS VHF antenna should be carefully considered. Digital communication is more sensitive than analogue/voice communication to interference created by reflections in obstructions like masts and booms. It may be necessary to relocate the VHF radiotelephone antenna to minimize interference effects.

To minimise interference effects, the following guidelines apply:

- The AIS VHF antenna should have omnidirectional vertical polarisation.

- The AIS VHF antenna should be placed in an elevated position that is as free as possible with a minimum of 2 metres in horizontal direction from constructions made of conductive materials. The antenna should not be installed close to any large vertical obstruction. The objective for the AIS VHF antenna is to see the horizon freely through 360°.

- The AIS VHF antenna should be installed safely away from interfering high-power energy sources like radar and other transmitting radio antennas, preferably at least 3 m away from and out of the transmitting beam.

- Ideally there should not be more than one antenna on the same level. The AIS VHF antenna should be mounted directly above or below the ship's primary VHF radiotelephone antenna, with no horizontal separation and with a minimum of 2 m vertical separation. If it is located on the same level as other antennas, the distance apart should be at least 10 m.

2.2.2 Cabling

The cable should be kept as short as possible to minimise attenuation of the signal. Double screened coaxial cables equal or better than RG214 are recommended.

All outdoor installed connectors on the coaxial cables should be waterproof by design to protect against water penetration into the antenna cable.

Coaxial cables should be installed in separate signal cable channels/tubes and at least 10 cm away from power supply cables. Crossing of cables should be done at right angles (90°). Coaxial cables should not be exposed to sharp bends, which may lead to change the characteristic impedance of the cable. The minimum bend radius should be 5 times the cable's outside diameter.

2.2.3 Grounding

Coaxial down-leads should be used for all antennas, and the coaxial screen should be connected to ground at one end.

2.3 GNSS Antenna installation

Class A AIS should be connected to a GNSS antenna.

2.3.1 Location

The GNSS antenna should be installed where it has a clear view of the sky. The objective is to see the horizon freely through 360° with a vertical observation of 5 to 90° above the horizon. Small diameter obstructions, such as masts and booms, do not seriously degrade signal reception, but such objects should not eclipse more than a few degrees of any given bearing.

Locate the antenna at least three meters away from and out of the transmitting beam of high-power transmitters (S-Band Radar and/or Inmarsat systems). This includes the ship’s own AIS VHF antenna if it is designed and installed separately.

If a DGNSS system is included or connected to the AIS system, the installation of the antenna should be in accordance with IEC 61108-4, Ed 1, annex D.

2.3.2 Cabling

To achieve optimum performance, the gain of the antenna pre-amplifier should match the cable attenuation. The resulting installation gain (pre-amplifier gain - cable attenuation) should be within 0 to 10 dB.

The coaxial cable between the antenna and the AIS shipborne station connector should be routed directly in order to reduce electromagnetic interference effects. The cable should not be installed close to high-power lines, such as radar or radio-transmitter lines or the AIS VHF antenna cable. A separation of one meter or more is recommended to avoid degradation due to RF-coupling. Crossing of antenna cables should be done at 90° to minimise magnetic field coupling.

All outdoor installed connectors on the coaxial cables should be waterproof by design to protect against water penetration into the antenna cable.

2.4 Power source

The AIS should be connected to an emergency power source.

2.5 Synchronization

After installation, the AIS should be synchronised properly on UTC and that position information, if provided, should be correct and valid.

3 Bridge Arrangement

3.1 Minimum Keyboard and Display

The functionality of the Minimum Keyboard and Display (MKD) should be available to the mariner at the position from which the ship is normally operated. This can be by means of the AIS' internal MKD (integrated or remote) or through the equivalent functionality on a separate display system

3.2 Pilot plug

A pilot input/output port is part of an AIS Class A station. A plug connected to this port should be installed on the bridge near the pilot's operating position so that a pilot can connect a Personal Pilot Unit (PPU).

The pilot plug should be configured as follows:

- AMP/Receptacle (Square Flanged (-1) or Free-Hanging (-2)), Shell size 11, 9-pin, Std. Sex 206486-1/2 or equivalent with the following terminations:

  - TX A is connected to Pin 1
  - TX B is connected to Pin 4
  - RX A is connected to Pin 5
  - RX B is connected to Pin 6
  - Shield is connected to Pin 9

3.3 Display system

If there is navigational equipment capable of processing and displaying AIS information such as ECDIS, radar or an integrated system available on board the ship, the AIS Class A mobile system may be connected to that system via the AIS Presentation Interface (PI). The PI (input/output) should meet the requirements of IEC 61162-2.

The display system can also include the functionality of an MKD, see 3.1.

3.4 Installation of the BIIT (Built-in Integrity Test) function

The AIS requires that an alarm output (relay) be connected to an audible alarm device or the ships alarm system, if available.

Alternatively, the BIIT alarm system may use the alarm messages output on the PI, provided its alarm system is AIS compatible.

4 Dynamic data input

4.1 External Sensors

The AIS has interfaces (configurable as IEC 61162-1 or 61162-2) for position, heading and rate of turn (ROT) sensors. In general, sensors installed in compliance with other carriage requirements of SOLAS Chapter V should be connected to the AIS.[1] The sensor information transmitted by AIS should be the same information being used for navigation of the ship. The interfaces should be configured as given in annex 3. Interfacing problems might occur if the existing sensors found on board do not have serial (IEC 61162) outputs.

4.2 Position, COG and SOG

GNSS sensors normally have IEC 61162 outputs for position, COG and SOG suitable for directly interfacing the AIS. However, it is important to note that:

- The Geodetic Datum of the position data transmitted by the sensor is WGS 84 and that an IEC 61162 DTM sentence is configured.

- AIS is able to process two reference points for its antenna position, one for external and one for an internal sensor. If more than one external reference point is used, the appropriate information needs to be input to the AIS to adjust reference point information.

4.3 Heading

A compass providing heading information is a mandatory sensor input to the AIS. A converter unit (e.g. stepper to NMEA) will be needed to connect AIS if the ship's compass does not provide an IEC 61162 output. Some ships of less than 500 gross tonnage may not carry a compass providing heading information.

4.4 Rate of Turn

All ships may not carry a Rate-Of-Turn (ROT) Indicator according to resolution A.526(13). However, if a rate-of-turn indicator is available and it includes an IEC 61162 interface, it should be connected to the AIS.

If ROT information is not available from a ROT indicator, the direction of turn may (optionally) be derived from heading information through:

- The compass itself,
- An external converter unit (see paragraph 4.3),
- The AIS itself (see annex 1).

[1] Installation of the AIS does NOT establish a need to install additional sensors above carriage requirements.

4.5 Navigational Status

A simple means should be provided for the operator to input the ship's navigational status (e.g. underway using engine, at anchor, not under command, restricted in ability to maneuver, etc) information into the AIS. The AIS may be connected to the ship's navigational status lights.

5 Static Information

The AIS standards require that certain static, voyage-related, and dynamic information be entered manually, normally by means of the MKD, or by means of IEC 61162 sentences "SSD" and "VSD" via the presentation interface if such provisions exist.

5.1 Entered at initial installation of AIS

Information that should be entered at the initial installation of the AIS includes:

- Maritime Mobile Service Identity (MMSI) number
- IMO vessel number
- Radio call sign
- Name of ship
- Type of ship
- Dimension/reference for position of the electronic position fixing device (EPFD) antenna (see paragraph 5.2)

Access to **MMSI, IMO number** and other AIS controls (like power and channel settings) will be controlled, e.g. by password.

The **Call Sign**, **Name of Ship** and **Type of Ship** should be input to the AIS, either manually using the MKD or by means of IEC 61162 sentences "SSD" and "VSD" via the PI. Type of Ship information should be in accordance with the table given in annex 2 (Table 18 from Rec. ITU-R M.1371-1).

For example, a cargo ship not carrying dangerous goods, harmful substances, or marine pollutants; would use identifier "70". Pleasure craft would use identifier "37". Note that those ships whose type identifier begins with a "3" should use the fourth column of the table.

Depending on the vessel, cargo and/or the navigational conditions, this information may be voyage related and would therefore need to be changed before beginning or at some time during the voyage. This is defined by the "second digit" in the fourth column of the table.

5.2 Reference point of position

The AIS stores one "external reference point" for the external GNSS antenna position and one "internal reference point" if an internal GNSS is to be used as fallback for position reporting. The locations of theses reference points have to be set during installation using values A, B, C, D; as described in paragraph 5.3.

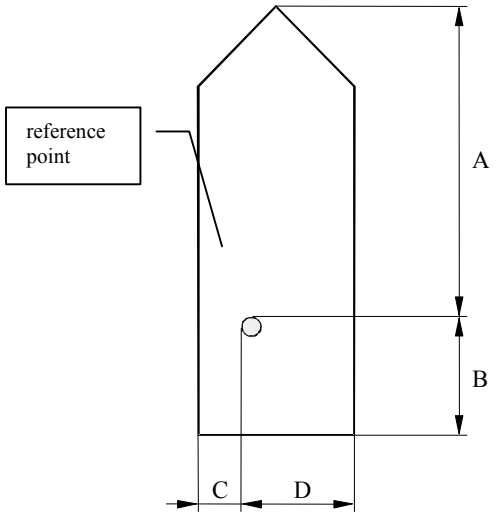
The external reference point may also be a calculated common reference position.

Additionally, the content of the Ship Static Data ("SSD") sentence on the PI, including the "reference point for position" is being processed by the AIS, and the AIS' memory for the "external reference point" is set in accordance with the content of this "SSD" (e.g. used by an INS).

5.3 Ship's dimensions

Ship's dimensions should be entered using the overall length and width of the ship indicated by the values A, B, C, and D in the following figure.

Ship's dimensions (A+B and C+D) should be identical when entering internal and external reference points.



	Distance (m)
A	*0 – 511 ; 511 =511 m or greater*
B	*0 – 511 ; 511 = 511 m or greater*
C	*0 - 63 ; 63 = 63 m or greater*
D	*0 - 63 ; 63 = 63 m or greater*

The dimension A should be in the direction of the transmitted heading information (bow)
Reference point of reported position not available, but dimensions of ship are available: A = C = 0 and B ≠ 0 and D ≠ 0.
Neither reference point of reported position nor dimensions of ship available: A = B = C = D = 0 (=default)
For use in the message table, A = most significant field, D = least significant field

In the rare case of an EPFD antenna installed in the portside corner of a rectangular bow, the values A and C would be zero. Should this be the case, one of these values should be set to 1 in order to avoid misinterpretation as "not available" because A=C=0 is used for that purpose.

6 Long-range function

The AIS' long-range function needs a compatible long-range communication system (e.g. Inmarsat-C or MF/HF radio as part of the GMDSS).

If this is available, a connection between that communication system and the Class A mobile unit can be made. This connection is needed to activate the LR function of AIS. Its input/output port should meet the requirement of IEC 61162-2.

Annex 1

RATE OF TURN

The AIS provides the Rate of Turn (ROT) information to other ships in order to early detect ships manoeuvres. There are two possible parameters indicating turning of a ship derived from two different sensors (see Figure 3: ROT sensor input):

- the heading from a GYRO or THD and
- the rotation rate itself from a Rate of Turn-indicator.

If a Rate of Turn Indicator according to resolution A.526(13) is connected, the AIS should use this information to broadcast both direction and value of turn on the VDL.

If valid ROT or HDG data is available from other external sources (Gyro, INS,...), the AIS should use this information to broadcast the direction of turn on the VDL, if greater than 5^o in 30 s (might also be implemented as 2.5° in 15 s by configuration); the AIS may also derive ROT information from HDG internally for that purpose.

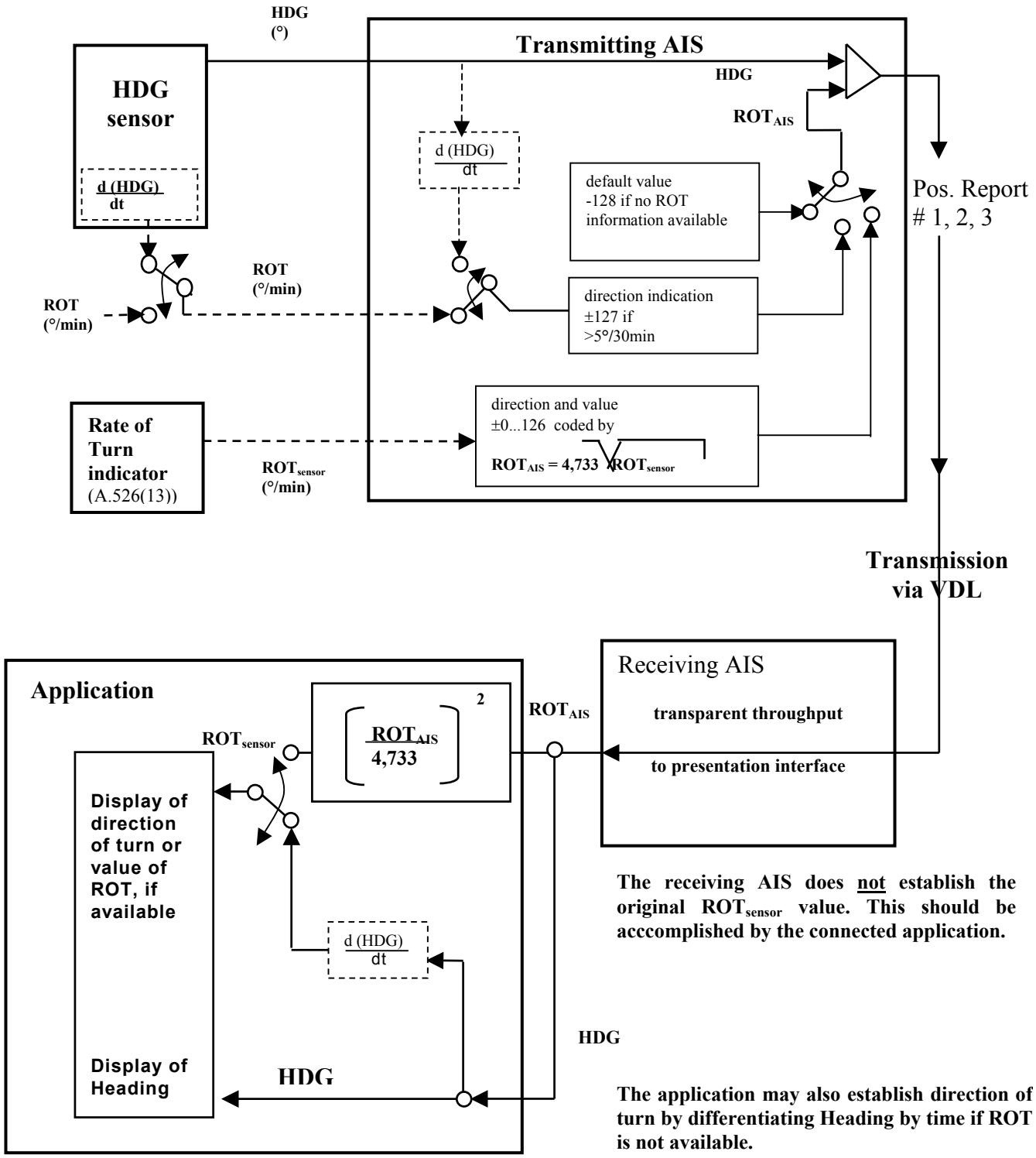
If no ROT information is available, the AIS should transmit default values indicating "not available". ROT data should not be derived from COG information.
If a ship is not required to carry Turn-Indicator or if external sensor fails, the AIS should react according to following priorities:

ROT sensor fallback conditions

Priority	Affected data in msg 1, 2, 3 ⇒ / Position Sensor status	contents of ROT field
1.	Rate of Turn Indicator in use [1]	0..+ 126 = turning right at up to 708° per minute or higher; 0..- 126 = turning left at up to 708° per minute or higher Values between 0 and 708°/min should be coded by $ROT_{AIS}=4.733\ SQRT(ROT_{sensor})$ degrees/min where ROT_{sensor} is the Rate of Turn as input by the external Rate of Turn Indicator (TI). Values of 709° per minute and above should be limited to 708° per min.
2.	other ROT source in use [2]	+ 127 = turning right at more than 5^o/30s (No TI available) 0 no turn - 127 = turning Left at more than 5^o/30s (No TI available)
3.	no valid ROT information available	–128 (80 hex) indicates no turn information available (default)

[1] Rate of Turn Indicator according to resolution A.526(13); determined by talker ID
[2] i.e. based on HDG information

Rate of Turn sensor input overview



The receiving AIS does <u>not</u> establish the original ROT_{sensor} value. This should be acccomplished by the connected application.

The application may also establish direction of turn by differentiating Heading by time if ROT is not available.

Annex 2

TYPE OF SHIP TABLE

Identifiers to be used by ships to report their type			
Identifier No.	Special craft		
50	Pilot vessel		
51	Search and rescue vessels		
52	Tugs		
53	Port tenders		
54	Vessels with anti-pollution facilities or equipment		
55	Law enforcement vessels		
56	Spare – for assignments to local vessels		
57	Spare – for assignments to local vessels		
58	Medical transports (as defined in the 1949 Geneva Convention and Additional Protocols)		
59	Ships according to Resolution No 18 (Mob-83)		
Other ships			
First digit (*)	Second digit (*)	First digit (*)	Second digit (*)
1 - reserved for future use	0 – All ships of this type	-	0 – Fishing
2 – WIG	1 – Carrying DG, HS, or MP IMO hazard or pollutant category A	-	1 – Towing
3 - see right column	2 – Carrying DG, HS, or MP IMO hazard or pollutant category B	3 – Vessel	2 – Towing and length of the tow exceeds 200 m or breadth exceeds 25 m
4 – HSC	3 – Carrying DG, HS, or MP IMO hazard or pollutant category C	-	3 – Engaged in dredging or underwater operations
5 – see above	4 – Carrying DG, HS, or MP IMO hazard or pollutant category D	-	4 – Engaged in diving operations
	5 – reserved for future use	-	5 – Engaged in military operations
6 – Passenger ships	6 – reserved for future use	-	6 – Sailing
7 – Cargo ships	7 –reserved for future use	-	7 – Pleasure Craft
8 – Tanker(s)	8 – reserved for future use	-	8 – reserved for future use
9 – Other types of ship	9 – No additional information	-	9 – reserved for future use

DG: Dangerous Goods.
HS: Harmful Substances.
MP: Marine Pollutants.

(*) **NOTE** – The identifier should be constructed by selecting the appropriate first and second digits.

Annex 3

RECOMMENDED IEC 61162 SENTENCES

To connect external sensors it is recommended to configure the following sentences as indicated below.

Preferred IEC 61162-1 Sensor Sentences

Data	IEC 61162-1 Sentence formatters	
	preferred	**optional**
Reference datum	DTM	
Positioning system: Time of position Latitude / Longitude Position accuracy	GNS GLL	GGA , RMC
Speed Over Ground (SOG)	VBW	VTG, OSD, RMC
Course Over Ground (COG)	RMC	VTG, OSD
Heading	HDT	OSD
RAIM indicator	GBS	
Rate Of Turn (ROT)	ROT	

EXHIBIT B- MARITEL CONTRIBUTION TO IALA ON AIS INTERFERENCE

IALA Contribution

Automatic Identification System (AIS)/ Maritime Communication System (MSC) Interference Guidelines

1.0 **Purpose** – The purpose of this paper is to provide guidelines for minimizing RF interference between an AIS system and other users of maritime spectrum. While AIS is designed and has the ability to operate in many modes, this paper focuses on interference from and to an AIS system operating in the default simplex mode in the proximity of a shore station system. Additionally, this paper does not address the significant impact of "impulse noise" (spike noise) that can be demonstrated to spread interference over 200 kHz from a transmitting AIS unit. This paper focuses exclusively on power interference from neighboring channel operations.

2.0 **Causes of AIS / MCS Interference –** Simplex communication using the B band of VHF maritime frequencies introduces several new Radio Frequency (RF) problems impacting the AIS shore station receiver and the maritime communication system (MSC) vessel receiver. These problems are caused by interference to receivers from transmissions in close proximity, which are much stronger than the receiver's sensitivity. The impact to the receiver can range from a marginal loss of performance bit errors) to desensitizing the receiver depending on the strength of the interference. For purposes of this paper, discussion of MCS interference will be limited to its impact to AIS shore stations, however, this interference will also potentially impact a vessel's AIS receiver based on the proximity to the MSC transmitter. Simplex interference has two primary components: Low Power Interference and High Power Interference.

2.1 Low Power Interference (LPI)– LPI is the result of transmitter power from neighboring channels impacting a receiver's ability to reliable receive information. This situation is caused by simplex operation in spectrum and transmission scheme historically designed for duplex operation. The impact comes from a duplex transmission's tendency to spread low level energy significantly outside of it's transmit band. A simplex receiver operating in close proximity to a duplex transmitter will be impacted by LPI.

Figure 1 illustrates this point by showing the allowable FCC transmitter emission mask along with two possible equipment transmitter profiles. The conservative emission mask shows ~75 kHz of frequency spread and the general emission mask shows ~150 kHz frequency spread of energy from a duplex transmitter. This paper has decided to use the conservative emissions mask for all calculations and comparisons, but stresses that LPI may be significantly worse based on the transmitters mask.

2.2 High Power Interference (HPI) – HPI is the result of transmitter power from neighboring channels impacting a receiver above it's Adjacent Channel Selection and Spurious Response Rejection levels. This situation is also

caused by simplex operation in spectrum and transmission scheme historically designed for duplex operation. The impact comes from "high power" transmissions (45 to 53 dBm) in close proximity to a simplex receiver at a –37 dBm Adjacent Channel Selection and Spurious Response Rejection characteristics. For reference, Figure 2 illustrates the AIS receiver characteristics.

3.0 **Modeling** – MariTEL has employed a third party interference simulation modeling tool to analyze the impact of interference to the AIS shore station receiver and MCS vessel receiver. This modeling tool is a wireless industry standard used by many major cellular providers in the US to plan and implement their networks. The goal of this type of modeling is to identify impacts and solutions to RF interference patterns before implementing an RF system.

3.1 RF modeling tools are only as good as the RF characteristics used in the model. In this case, characteristics of transmitters and receivers in areas of interest are "outside the specification" which resulted in some assumptions being made as to the actual equipment characteristics. Specifically, because a FCC MCS transmitter mask is so wide and an AIS transmitter mask is only defined to –70 dBc, interpellations of "real world" characteristics were required. For most all cases, model inputs were verified by with major equipment manufacturers and/or measured in the Lab.

3.2 Transmission Mask - Figure 1 shows the "conservative" MCS transmitter emissions mask used for this analysis as compared with the FCC's allowable emissions and another general emissions mask. Lab tests have validated the general accuracy of this assumption for specific equipment but these results may vary widely based on the specific vendors implementation.

3.3 Receiver Mask – Figure 2 shows a "real world" receiver masks for AIS. Major equipment manufacturers and Lab measurements have validated the general accuracy of these inputs but equipment performance may vary widely based on vendor implementation.

4.0 Results -

4.1 AIS Shore Impact - Figure 3 shows the interference impact from operating a MCS adjacent to an AIS shore system. The result is the adjacent channel transmitter injects both LPI and HPI directly into the AIS simplex receiver. This interference is only present when the MCS is transmitting, which depending on the type of system may be infrequent or almost continuous. The results indicate, however, that any MCS interference to the AIS system could potentially be devastating.

More specifically, Figure 3 shows the significant LPI and HPI. These two types of interferences impact the AIS channel very differently. LPI will tend to lessen the range of an AIS system by raising the "noise floor" of the channel in direct proportion to the injected power. HPI will tend to desensitize or overload the AIS receiver potentially completely disrupting the AIS VDL and causing the AIS receiver to re-synchronize. The synchronization procedure may take in excess of 4 minutes.

Figures 5 shows the impact of attenuating MCS transmissions and Figure 6 shows the impact of a 25 kHz guardband to the AIS receivers. Figure 7 shows a scenario for eliminating MCS interference to AIS receivers using the model assumptions. The result is a 25 kHz guardband and greater than 90 dB attenuation on neighboring channels.

4.2 MCS Ship Impact - Figure 4 shows the interference impact to the MCS vessel receiver from an AIS transponder operating on adjacent channels. The result is similar to the shore impact with the adjacent channel transmitter injecting both LPI and HPI directly into the MCS receiver. This interference is only present when the AIS transponder is transmitting, which may be every 10 seconds or almost continuously depending on the activity of the vessel, however, the results show that interference to the MCS could potentially be devastating.

More specifically, Figure 4 shows the significant LPI and HPI. These two types of interferences impact the MCS channel very differently. LPI will tend to lessen the range of the MCS system by raising the "noise floor" of the channel in direct proportion to the injected power. HPI will tend to desensitize or overload the MCS receiver potentially completely disrupting communication and causing the receiver to re-start. The restart procedure may take up to 1 minute.

Figure 8 shows a scenario for eliminating AIS interference to AIS vessel receivers using the model assumptions. The result is a 25 kHz guardband and greater than 80 dB attenuation on neighboring channels.

5.0 **Guidelines for Minimizing Interference** – Insuring "power separation" between systems is the most practical means of minimizing interference between AIS and MCS users. While many implementation methods are available to help minimize neighboring channel interference such as filtering or antenna design, these methods are largely in effective at removing interference injected directly in the receiver's channel. The most effective solution to minimizing this interference is to isolate these systems through a combination of frequency guard bands and power attenuation.

5.1 AIS Shore Station Guidelines –

5.1.1 Because of the potentially disastrous impact of MCS on an AIS system, an AIS system should have a mandatory 25 kHz guardband on either side of AIS1 and AIS2 (maritime channels 27 & 28) to minimize LPI. (Refer to Figure 6 for a graphical display.)

5.1.2 Outside of the 25 kHz guard band, but up to 100 kHz from AIS1 and AIS2, MCSs should be managed such that power from a MCS does not exceed –40 dBm at the AIS receiver to eliminate HPI. Solutions for managing HPI to an AIS receiver are dependent on several factors including the type of MCS and the equipment transmission / receiver characteristics, but will most likely involve filtering and/or geographic horizontal separation of system antennas. Horizontal distances of greater than 5 miles may be required to eliminate MCSs impact to AIS. (Refer to Figure 7 for a graphical display.)

5.2 AIS Vessel Guidelines –

5.2.1 Because of the impact to vessel MCS's from a vessel AIS transponder, the AIS system should have a mandatory 25 kHz guardband on either side of AIS1 and AIS2 (maritime channels 27 & 28) to minimize LPI. (Refer to Figure 8 for a graphical display.)

5.2.2 Outside of the 25 kHz guard band, but up to 100 kHz from AIS1 and AIS2, AIS vessel installations should insure that power from an AIS system should not exceed –40 dB at the MCS receiver to eliminate HPI. Solutions for managing vessel AIS interference are dependent on several factors including the type of MCS and equipment transmission / receiver characteristics, but will most likely involve filtering and/or significant vertical separation of antennas or potentially additional guard band frequency. Because vertical distances are often limited on a vessel, special antenna designs may be required to insure AIS attenuation can be achieved.

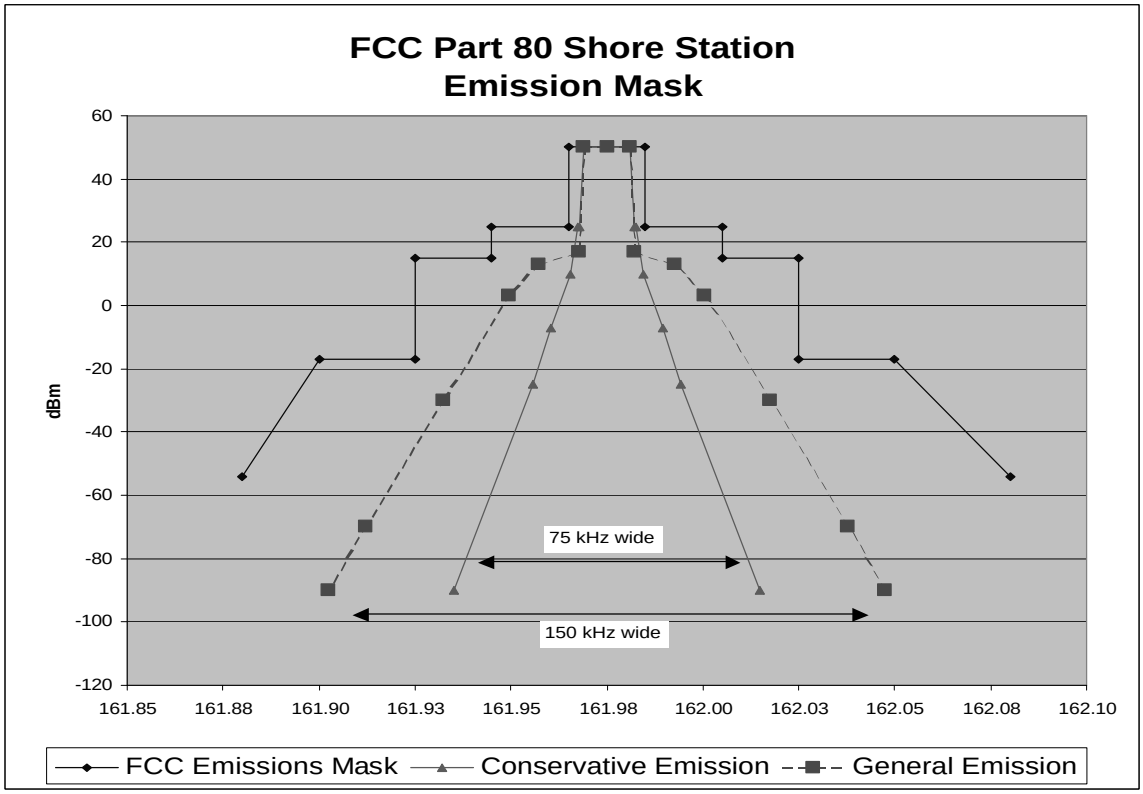


Figure 1: Duplex Transmitter Emissions

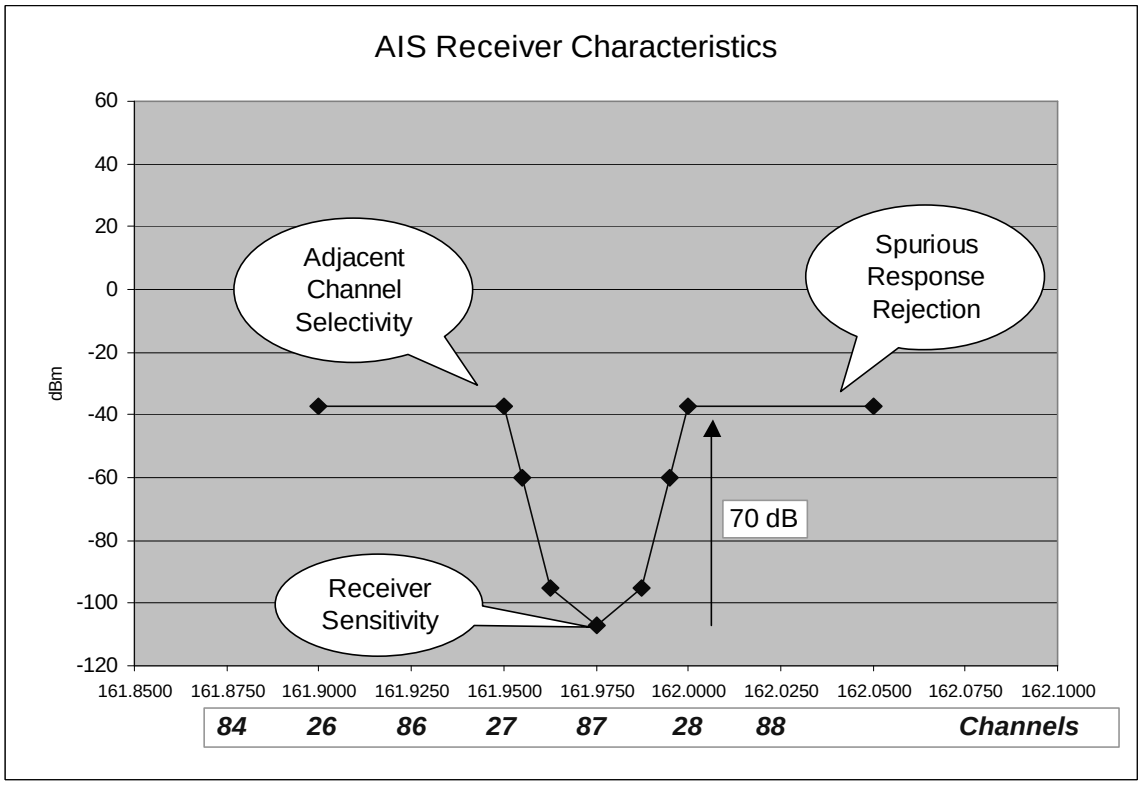


Figure 2: AIS Receiver Characteristics

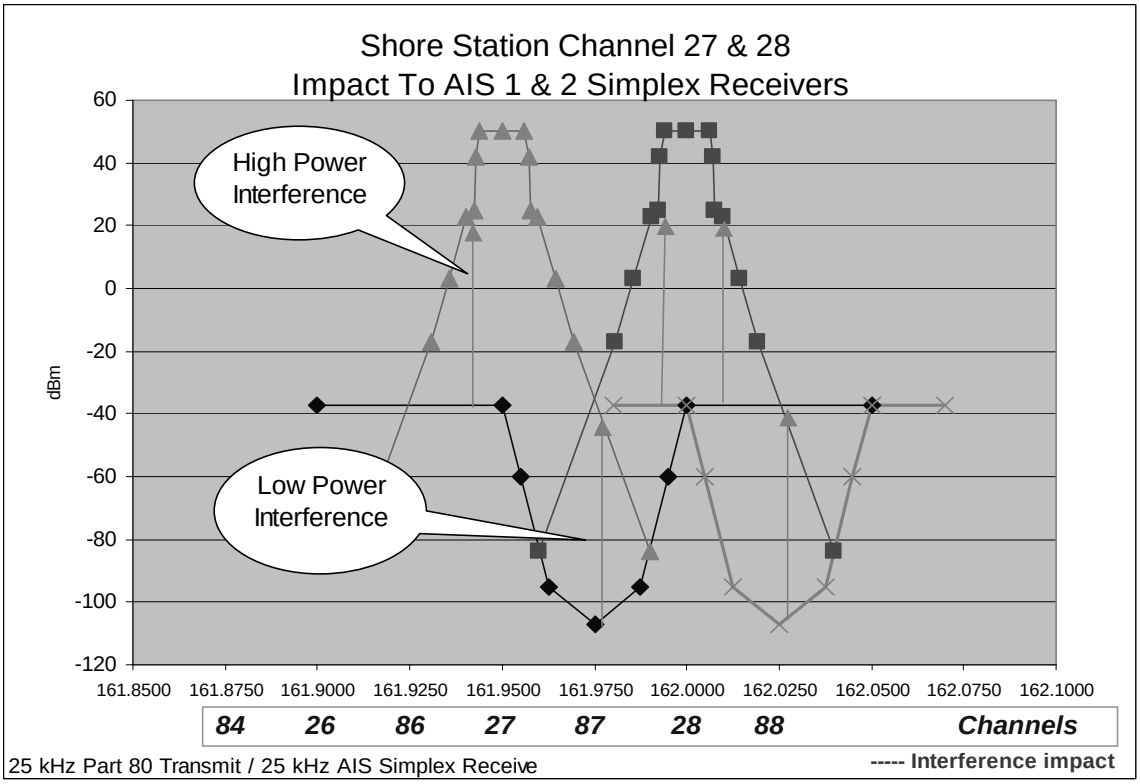


Figure 3: Impact to AIS shore receivers

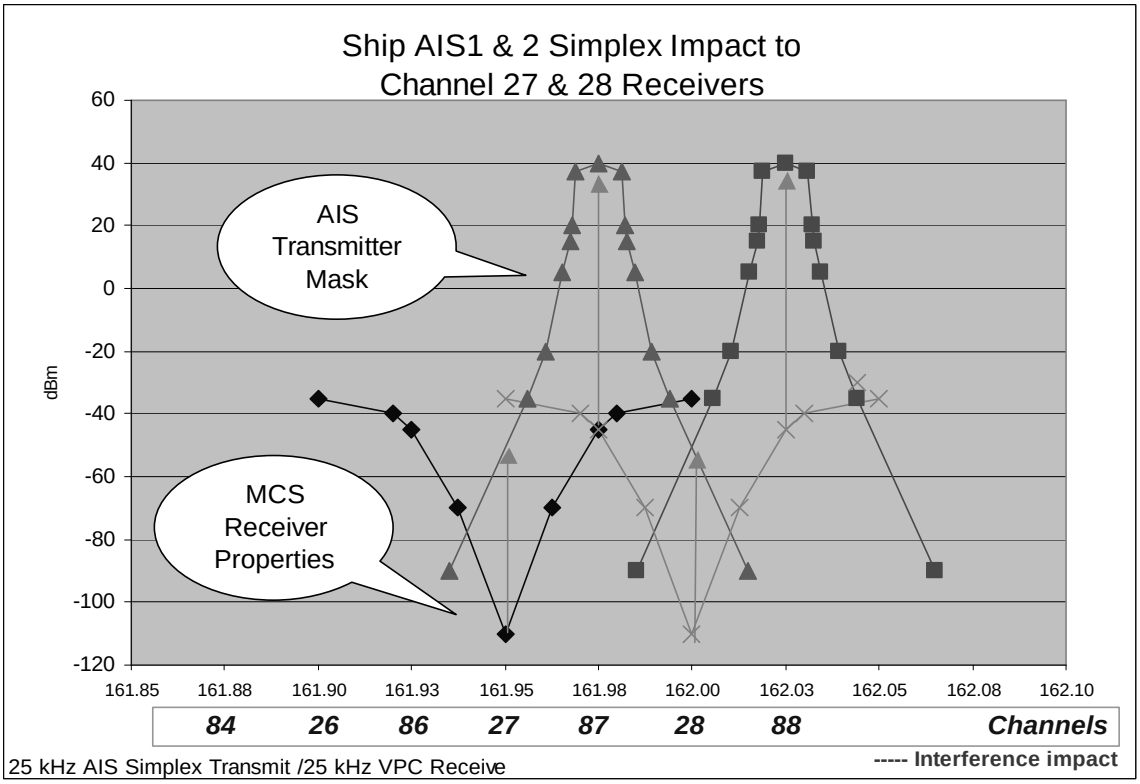


Figure 4: Impact to ship MCS receivers

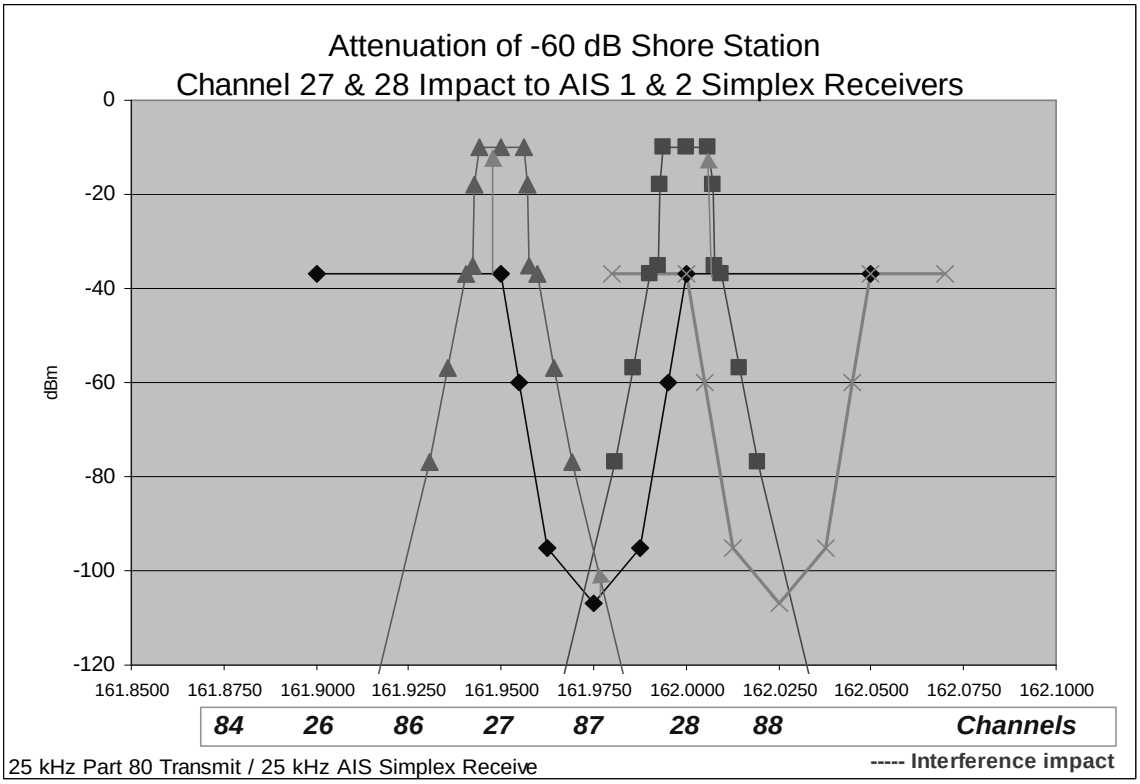


Figure 5: Attenuation impact to AIS receivers

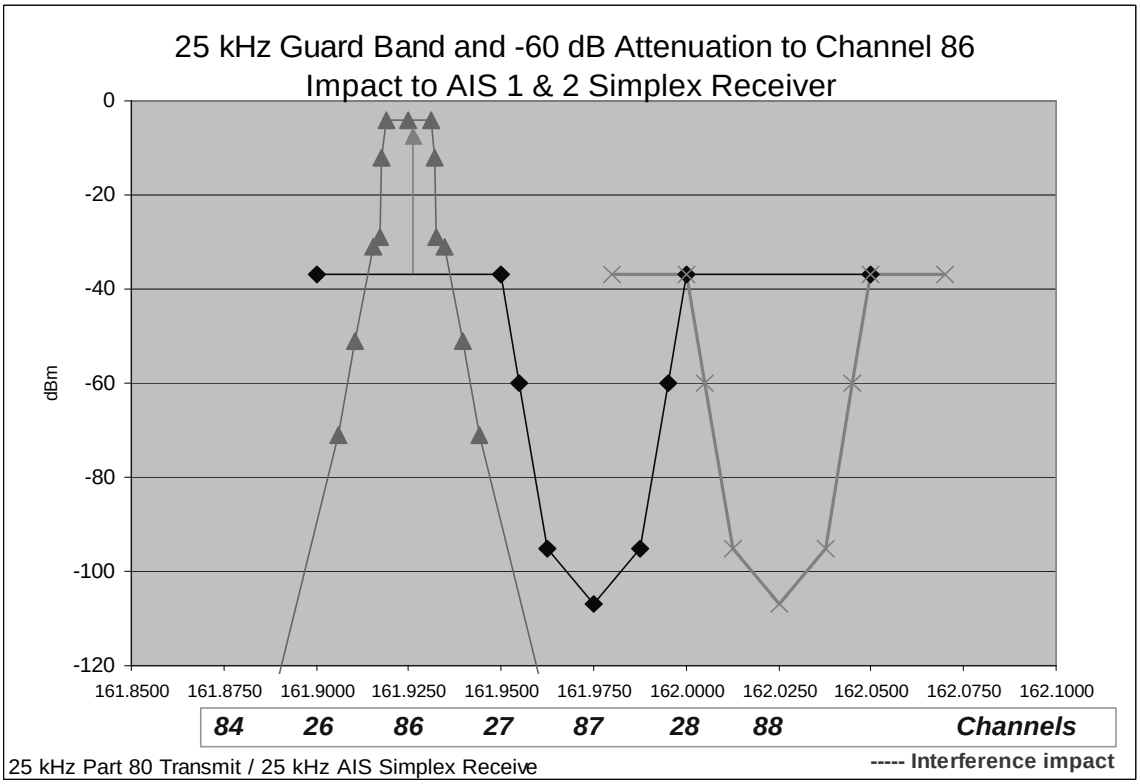


Figure 6: Guardband impact to AIS receiver

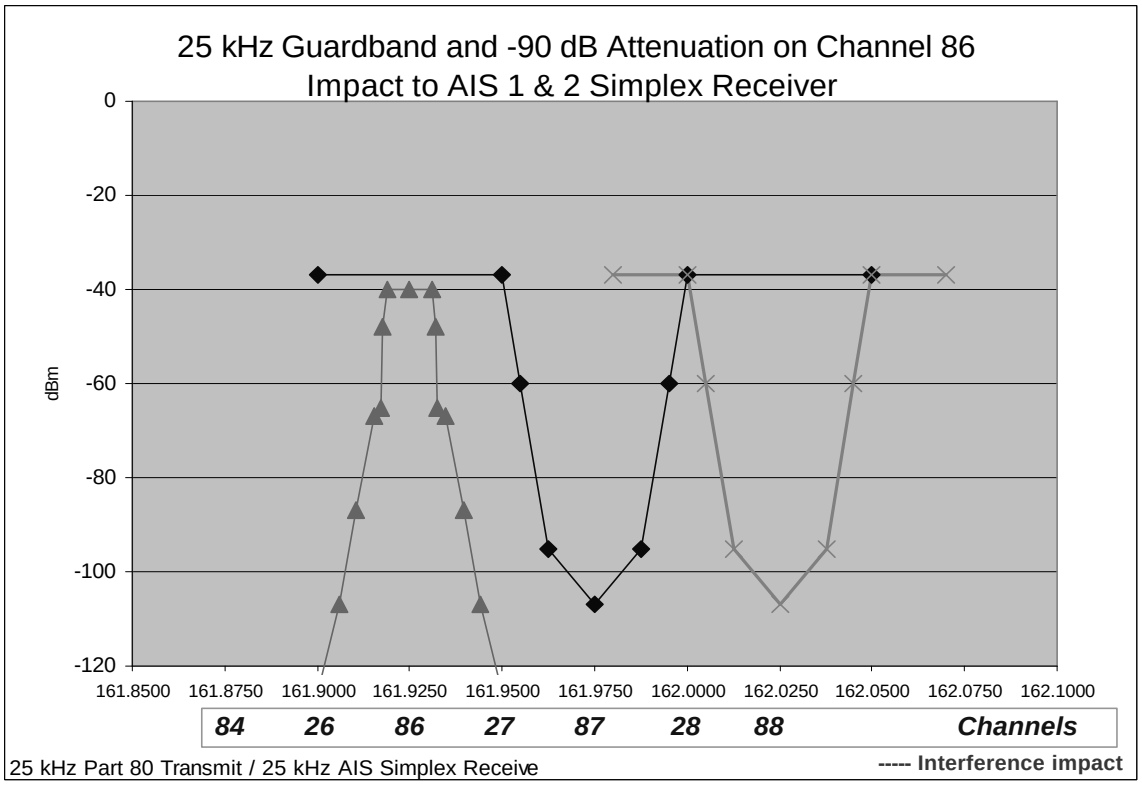


Figure 7: Elimination of interference to AIS receivers

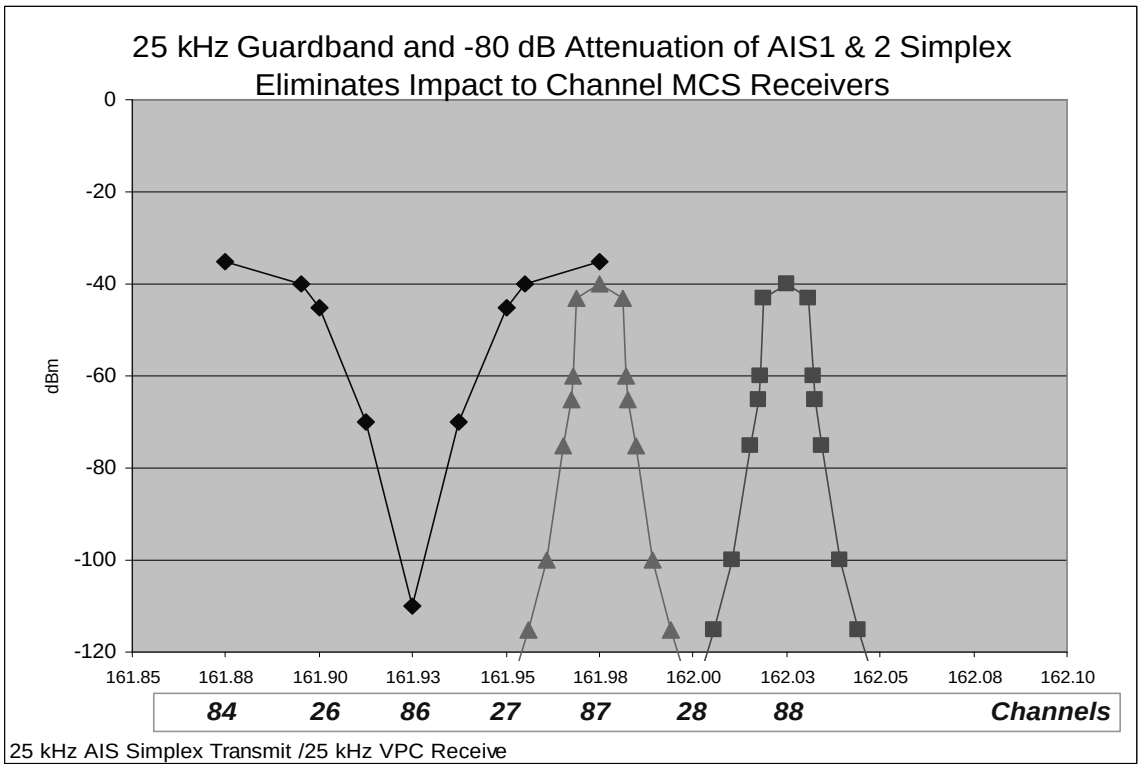


Figure 8: Elimination of interference to MCS receivers

CERTIFICATE OF SERVICE

I, Susan Duarte, hereby certify that I have, on this 29th day of August 2003, caused a copy of the foregoing Supplemental Comments to be sent via first class mail to the following:

Joseph D. Hersey, Jr.
Chief, Spectrum Management Division
Office of Communications Systems
2100 Second Street, S.W.
Washington, DC 20593-0001

Robert M. Gurss
Fletcher, Heald & Hildreth PLC
1300 N. 17th Street
11th Floor
Arlington, Virginia 22209

/s/ Susan F. Duarte
Susan F. Duarte